

## Original Article

# Evaluation of role of computed tomography scan brain in children with generalized seizures

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## Abstract

**Objective:** To evaluate the role of computed tomography (CT) scan brain in children over the age of 1 year with generalized seizures.

**Design:** Prospective, hospital-based study. **Materials and Methods:** Children of 1-12 years presenting with generalized seizures in pediatric outpatient department and emergencies were subjected for CT scan brain with contrast along with other appropriate investigations after stabilization. **Results:** A total of 101 cases of children with generalized seizures underwent CT scan brain, 36 cases (35.64%) were found to have CT brain abnormalities. **Conclusion:** CT brain should be considered in children with generalized seizures in health care settings where magnetic resonance imaging is either unavailable or unaffordable.

**Key words:** *Computed tomography scan, Generalized seizures, Brain imaging, children*

Seizures are common in children and seen in approximately 10% of the children [1]. Approximately 4-6% of children have a single seizure during their childhood, and approximately 1% has two or more episodes. There are two places Jocote and Quesada, these are not authors name. Please change it as The crude prevalence of epilepsy was estimated to be around 28 cases /1000 in El Jocote and 29 cases/1000 in Quesada [2] The majority of epilepsy has its onset in childhood [3]. The majority of epilepsy has its onset in childhood. Appropriate diagnosis and management of childhood epilepsy are essential to improve quality of life in these children [4]. A seizure occurring within a week of an acute brain insult (trauma, infection, toxic, metabolic, or vascular insult) is called an acute symptomatic seizure. Future risk of unprovoked seizures is around 3-10% [5].

Electroencephalography (EEG) is recommended as a part of initial evaluation in all children presenting with an episodic event. Epileptiform abnormalities in the EEG support a clinical diagnosis of seizure, help in the diagnosis of specific syndromes, and predict seizure recurrence [3]. Imaging provides important contributions in establishing etiology, providing prognostic information, and directing treatment in children with recently diagnosed epilepsy [6]. A computed tomography (CT) scan is now widely available with a low marginal cost in private and public sector hospitals [7]. A plain CT scan is indicated in traumatic brain injury and a contrast enhanced CT scan is indicated in children above 2 years, especially those presenting with convulsive seizures, focal seizures, and clusters of seizure [8].

For neuroimaging, magnetic resonance imaging (MRI) is more sensitive than CT and is the modality of choice. MRI protocol should be adapted to the age of the child and the type of epilepsy syndrome [9]. CT retains a role in detecting calcification and in acute situations such as head trauma, status epilepticus, and epilepsy, where granulomas are a possibility. A considerable treatment gap exists in developing countries due to poverty, stigmatization, and lack of trained manpower [10]. New-onset partial or generalized convulsive seizures occurring in clusters in an otherwise normal child is the most common presentation of single small contrast enhancing CT lesion; necessitating neuroimaging, except when an idiopathic epilepsy syndrome is established with EEG [11]. CT scan brain is indicated in children with partial seizures but its role in children with generalized seizure is doubtful. There is paucity of studies evaluating the role of cranial imaging in the children with generalized seizures. Considering above facts, the present study was done to evaluate the role of CT scan brain in children with generalized seizures.

## MATERIALS AND METHODS

This study was prospective and hospital-based study conducted in a tertiary care teaching hospital in North India. The study was conducted over a span of 1 year from August 1<sup>st</sup>, 2013 to July 31<sup>st</sup>, 2014. Ethical clearance was obtained from Ethical Committee of the College. Children between 1 and 12 years presenting with generalized seizures or status epilepticus in outpatient department (OPD) and emergencies were included in the study. Written consent was taken from the parents before recruiting the patients. Children with acute brain insult,

traumatic causes, and metabolic causes of seizures were excluded from study. Children with febrile seizure were also excluded from study.

All children were initially stabilized and seizures were controlled with appropriate medications. After taking detailed clinical history and physical examination, these children were subjected to CT scan brain with contrast along with other appropriate investigations. CT scan was obtained after 24 h and within 15 days of seizure in all children. Sedation was not required in most of the children especially older children but few required in form of triclofos and diazepam. CT scan was performed in the Department of Radiology by CT technician, and reporting was done by the radiologist.

## RESULTS

A total of 217 cases of seizures were subjected to CT scan during study period. Among these, only 101 cases were presented with generalized seizures and included in the study. Out of these cases, 71 cases were initially admitted in emergency and 30 children were investigated from OPD. Cases not fitting in inclusion criteria were excluded from study.

**Table 1: Type of lesion in CT scan brain of children with generalized seizures**

Type of lesion	Number of cases	Percentage
Single inflammatory granuloma/ calcification/ localized edema/ abscess	06	5.94
B/L, generalized cerebral atrophy	05	4.95
B/L, generalized cerebral edema	17	16.83
Multiple lesions/ multiple calcification	08	7.92
Normal study	65	64.35
Total	101	

**CT: Computed tomography**

**Table 2: CT scan findings in different type of generalized seizures**

Type of seizures	Number of cases	CT scan finding	Number of cases	Percentage
Generalized tonic/clonic seizures	90	Localized lesion	04	4.44
		Generalized lesion	27	30.00
		Normal study	59	65.56
Absence seizures	02	Localized lesion	00	00
		Generalized lesion	00	00
		Normal study	02	100
Myoclonic seizures	04	Localized lesion	01	25
		Generalized lesion	02	50
		Normal study	01	25
Tonic/clonic/ atonic seizures	05	Localized lesion	01	20
		Generalized lesion	01	20
		Normal study	03	60
Total	101		101	

**CT: Computed tomography**

Other investigations like EEG, routine blood investigations were done in most of the cases but were not recorded in the study proforma. About 36% cases showed abnormal CT scan, of which most common abnormality was generalized cerebral edema (16.83%) followed by multiple lesions (7.92%) as shown in Table 1. Out of 101 cases, 6 were showing localized lesions, 30 had generalized lesions and 65 cases had normal CT study. The most common localizing lesion was granuloma and the most common generalized lesion was cerebral edema.

Clinically, 90 out of 101 cases had generalized tonic/clonic seizures at the time of presentation. However, only 30% cases had generalized lesion on CT scan and approximately 65% cases had normal CT brain study as shown in Table 2. Generalized lesions include generalized cerebral edema, atrophy, multiple granuloma, and calcification. Localized lesions comprised solitary lesions (such as granuloma/calcification/abscess/mass), localized edema, atrophy.

## DISCUSSION

Approximately 4-6% of children are expected to have a seizure by the age of 16 years [1]. The role of emergent neuroimaging for children with a new seizure, specially generalized seizure, is not well-understood. This is because the prevalence of neuroimaging abnormalities in this group has yet not been determined [12]. The prevalence of abnormalities in CT scan reported in different studies varied from 5% to above 50% as described in Table 3. [6,12-18]. In the present study, 6 cases had localized lesions in form of tuberculoma, neurocysticercosis, localized calcifications, and abscess and localized atrophic changes. They had presented with generalized seizures instead partial seizures which we were expecting in them. We also found 8 cases with multiple granulomas and calcifications. Etiological diagnosis and line of management were decided by CT brain in these cases which were not feasible without imaging studies.

**Table 3: CT scans abnormality in different studies of generalized seizures**

Study	Total number of cases	Number of cases with abnormal CT scan N (%)
Alawneh and Bataineh, 2008, Jordan [15]	78	05 (6.4)
Khreisat, 2006, Jordan [13]	100	50 (50)
Khodapanahandeh and Hadizadeh, 2006. Iran [12] included all children with afebrile seizure	119	12 (10)
Njuguna et al., 2007, Kenya [16], Included children with all type of neuronal abnormalities	34	16 (47)
Patel et al., 1986, Saudi Arabia [17]	57	06 (10.52)
Nair et al., India, [18] included cases of status epilepticus	44	21 (47.7)
Present study, 2014, North India	101	36 (35.64)

**CT: Computed tomography, MRI: Magnetic resonance imaging**

The incidence of high percentage of abnormality in the case of generalized seizures are most probably because of the high prevalence of tuberculosis and neurocysticercosis in our locality and many of children are presenting as partial seizure with secondary generalization. Their histories were misleading because of no eye witness for history or not remembering the beginning of seizures correctly. Though CT scan is having radiation exposure risk but single exposure is not having much risk as compared to seizures complications. Children with epilepsy are frequently evaluated in the emergency department for breakthrough seizure activity. This population is at risk for undergoing repeated CT scans [19]. CT scan brain is an important investigation and should be used in generalized seizures because it is affordable and available at many smaller centers. Limitations of the study include small sample size, and lack of long-term follow-up with repeat CT scan.

**CONCLUSION**

The present study showing that CT brain was abnormal in more than 35% of cases of generalized seizures. CT scan can detect many of localized lesions in cases of generalized seizures. CT brain may also be used in cases of generalized seizures, not only in partial seizures especially where the MRI facility is not available and affordable.

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